

CLAIMS

1. A method of photolithographically patterning a surface of a substrate, comprising:
 - forming a photoreactive layer on the surface of the substrate;
 - transmitting light through a patterning portion of a first photolithographic mask to expose a first portion of the photoreactive layer;
 - transmitting light through a patterning portion of a second photolithographic mask to expose a second portion of the photoreactive layer; and
 - removing at least part of the first and second portions of the photoreactive layer.
2. The method of claim 1 wherein transmitting light through the patterning portion of the first photolithographic mask comprises transmitting light through the first patterning portion of the first photolithographic mask simultaneously with transmitting light through the patterning portion of the second photolithographic mask.
3. The method of claim 1 wherein transmitting light through the patterning portion of the second photolithographic mask comprises transmitting light through the patterning portion of the second photolithographic mask subsequent to transmitting light through the patterning portion of the first photolithographic mask.
4. The method of claim 1, further comprising transmitting light through a transparent portion of the first photolithographic mask simultaneously with transmitting light through the patterning portion of the first photolithographic mask.
5. The method of claim 4 wherein transmitting light through the second patterning portion of the second photolithographic mask comprises transmitting the light through the transparent portion of the first photolithographic mask through the patterning portion of the second photolithographic mask.

6. The method of claim 1, further comprising blocking an unexposed portion of the photoreactive layer from being exposed to light with a blocking portion of the first photolithographic mask simultaneously with transmitting light through the patterning portion of the first photolithographic mask.

7. The method of claim 6 wherein transmitting light through the patterning portion of the second photolithographic mask comprises transmitting light through the second patterning portion of the second photolithographic mask corresponding to the first unexposed portion of the photoreactive layer.

8. The method of claim 1, further comprising:
prior to transmitting light through the first patterning portion of the first photolithographic mask, positioning the first photolithographic mask between a light source and the photoreactive layer;

after transmitting light through the first patterning portion of the first photolithographic mask, removing the first photolithographic mask; and

after removing the first photolithographic mask and prior to transmitting light through a second patterning portion of a second photolithographic mask, positioning the second photolithographic mask between the light source and the photoreactive layer.

9. The method of claim 1, further comprising:
prior to transmitting light through the patterning portion of the first photolithographic mask, and prior to transmitting light through the patterning portion of the second photolithographic mask, simultaneously positioning the first and second photolithographic masks between a light source and the photoreactive layer.

10. A method of forming a desired pattern on a surface of a substrate, comprising:

forming a photoreactive layer on the surface of the substrate;

positioning a first photolithographic mask having a patterning portion between a light source and the photoreactive layer;

transmitting light through the patterning portion of the first photolithographic mask to expose a first portion of the photoreactive layer;

positioning a second photolithographic mask having a patterning portion between the light source and the photoreactive layer;

transmitting light through the patterning portion of the second photolithographic mask to expose a second portion of the photoreactive layer; and

removing at least part of the first and second portions of the photoreactive layer.

11. The method of claim 10 wherein transmitting light through the patterning portion of the second photolithographic mask comprises transmitting light through the patterning portion of the second photolithographic mask simultaneously with transmitting light through the patterning portion of the first photolithographic mask.

12. The method of claim 10 wherein the desired pattern comprises a memory circuit, and wherein transmitting light through the patterning portion of the first photolithographic mask comprises transmitting light through the patterning portion of the first photolithographic mask to expose a memory array portion of the memory circuit, and transmitting light through the patterning portion of the second photolithographic mask comprises transmitting light through the patterning portion of the second photolithographic mask to expose a periphery portion of the memory circuit.

13. The method of claim 10 wherein transmitting light through the patterning portion of the second photolithographic mask comprises transmitting light through the patterning portion of the second photolithographic mask simultaneously with transmitting light through the patterning portion of the first photolithographic mask.

14. The method of claim 10 wherein positioning the first photolithographic mask having the patterning portion between the light source and the photoreactive layer comprises positioning a first photolithographic mask having a first opaque portion, further comprising blocking a first unexposed portion of the photoreactive layer with the first opaque portion of the first photolithographic mask simultaneously with transmitting light through the patterning portion of the first photolithographic mask.

15. The method of claim 14 wherein blocking the first unexposed portion of the photoreactive layer with the first opaque portion of the first photolithographic mask comprises blocking the first unexposed portion of the photoreactive layer coinciding with the second portion of the photoreactive layer.

16. The method of claim 14 wherein positioning the second photolithographic mask having the patterning portion between the light source and the photoreactive layer comprises positioning a second photolithographic mask having a second opaque portion, further comprising blocking a second unexposed portion of the photoreactive layer with the second opaque portion of the second photolithographic mask simultaneously with transmitting light through the patterning portion of the second photolithographic mask.

17. The method of claim 16 wherein blocking the first unexposed portion of the photoreactive layer with the first opaque portion of the first photolithographic mask comprises blocking the first unexposed portion of the photoreactive layer coinciding with the second portion of the photoreactive layer, and wherein blocking the second unexposed portion of the photoreactive layer with the second opaque portion of the second photolithographic mask comprises blocking a second unexposed portion of the photoreactive layer coinciding with the first portion of the photoreactive layer.

18. The method of claim 10 wherein transmitting light through the patterning portion of the second photolithographic mask to expose a second portion comprises transmitting light through the patterning portion of the second photolithographic

mask to expose a second portion that partially overlaps with the first portion of the photoreactive layer.

19. The method of claim 10 wherein positioning the first photolithographic mask having the first patterning portion between the light source and the photoreactive layer comprises positioning a first photolithographic mask having a transparent portion, further comprising transmitting light through the transparent portion of the first photolithographic mask simultaneously with transmitting light through the patterning portion of the first photolithographic mask.

20. The method of claim 19 wherein transmitting light through the patterning portion of the second photolithographic mask comprises transmitting light through the transparent portion of the first photolithographic mask through the patterning portion of the second photolithographic mask.

21. A method of forming a memory device including a memory circuit, comprising:

forming a photoreactive layer on an underlying material;

transmitting light through a first photolithographic mask to form a first patterned region of the photoreactive layer corresponding to a memory array region of the memory circuit;

transmitting light through a second photolithographic mask to form a second patterned region of the photoreactive layer corresponding to a periphery region of the memory circuit; and

removing a portion of the photoreactive layer.

22. The method of claim 21 wherein transmitting light through the first photolithographic mask to form the first patterned region of the photoreactive layer comprises transmitting light through the first photolithographic mask to form a patterned region not including the second patterned region of the photoreactive layer.

23. The method of claim 21 wherein transmitting light through the second photolithographic mask to form a second patterned region of the photoreactive layer comprises transmitting light through the second photolithographic mask to form a patterned region not including the first patterned region of the photoreactive layer.

24. The method of claim 21, further comprising, simultaneously with transmitting light through the first photolithographic mask, blocking light from exposing the second patterned region of the photoreactive layer.

25. The method of claim 21, further comprising, simultaneously with transmitting light through the second photolithographic mask, blocking light from exposing the first patterned region of the photoreactive layer.

26. The method of claim 21 wherein transmitting light through the second photolithographic mask onto the second patterned region of the photoreactive layer comprises transmitting light through the first photolithographic mask and through a second photolithographic mask onto the second patterned region of the photoreactive layer

27. The method of claim 21 wherein transmitting light through the first photolithographic mask to form the first patterned region of the photoreactive layer comprises transmitting light through the patterning portion of the photolithographic mask through a transparent portion of the photolithographic mask, and transmitting light through the second photolithographic mask onto the second patterned region of the photoreactive layer comprises transmitting light through the second photolithographic mask onto the second patterned regions of the photoreactive layer.

28. The method of claim 21 wherein the photoreactive layer is formed from a photoresist and removing portions of the photoreactive layer comprises developing the photoresist.

29. The method of claim 21 wherein forming the photoreactive layer on an underlying material comprises forming a photoreactive layer on a semiconductor substrate.

30. A photolithographic assembly for patterning a photoreactive layer, comprising:

a light source;

a support adapted to support the photoreactive layer proximate the light source;

a first photolithographic mask positioned between the light source and the support, the first photolithographic mask having a patterning portion for patterning a first portion of the photoreactive layer; and

a second photolithographic mask positioned between the light source and the support, the second photolithographic mask having a patterning portion for patterning a second portion of the photoreactive layer.

31. The assembly of claim 30 wherein at least part of the second photolithographic mask is positioned between the first photolithographic mask and the support.

32. The assembly of claim 30 wherein the second photolithographic mask is positioned in alignment with the first photolithographic mask.

33. The assembly of claim 30, further comprising a robotic handler for positioning the first and second photolithographic masks between the light source and the support.

34. The assembly of claim 30 wherein the first photolithographic mask includes a first blocking portion for preventing exposure of the second portion of the photoreactive layer.

35. The assembly of claim 34 wherein the second photolithographic mask includes a second blocking portion for preventing re-exposure of the first portion of the photoreactive layer.

36. The assembly of claim 30 wherein the first patterning portion comprises a memory element portion.

37. The assembly of claim 36 wherein the second patterning portion comprises a periphery portion.

38. The assembly of claim 30, further comprising a lens positioned between the light source and the support.

39. The assembly of claim 30, further comprising a condenser positioned between the light source and the support.